Invisibility Tarpaulin Based Upon Angular Momentum-Contingent Reflectivity

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Introduction

Ideal for reproducing some of the optical properties of calcite lenses which are difficult to reproduce in a lab setting, polymers are capable of producing superior results in the area of visible light cloaking.

Abstract

Low-temperature plasmas can be used to etch pathways within these polymer structures to guide the flow of light from one side to the other, producing the effect known as cloaking. To support mass production, a LASER-light transmission matrix (similar to the structure of an irrigation system) could brought into close proximity with one of these polymer sheets and be used to produce plasmas in a broadly hexagonal configuration. Areas of the polymer exposed to the plasma would become mirror-like and would redirect light as needed to convey it from one "side" to the other.

To achieve this, the tarpaulin used would have to have an in-facing side with no special optical properties, with the tarpaulin draped over a dirigible, for example. The tarpaulin could be cinched, or better yet, tucked, at the bottom to keep it from blowing away.

Going from the "inside" out, from the area closest to the object to be hidden (in my example, a dirigible) the tarpaulin would consist of a matte black layer (or sky blue for dirigible use) not meant to be seen which would have to be tucked to hide it, a special optical layer, and another transparent layer to protect and contain everything on the outside that could be cleaned as needed.

The object of the optical layer is to generally allow light into the structure. Once inside, light must be flow in the transverse direction, continue traveling transversely through the tarpaulin, and then be allowed to exit moving with the same angular momentum it had when it entered. All parts of the outward-facing part of the tarpaulin must perform consistently and be capable of both accepting and emitting light.

How then, does the tarpaulin "know" at what point light should be emitted? How does the light "know" that it has reached the other side and that it's time to exit the tarpaulin?

The answer has to lie in wide but short optical channels that are both absolutely reflective and absolutely parallel. In a fiber-optic cable, light is restricted both in height and width and follows a linear path. This tarpaulin would need to restrict light by repeatedly reflecting it between a "floor" and a "low ceiling" while leaving light free to move laterally. With each "bounce," the light would experience a change in its phase.

Only light that possesses a perfect zero phase would be allowed to exit on the other side with no hindrance. The backside of the outer layer will only allow light with one polarization to escape. Only light that has traveled 180 degrees around the object will have its original polarity restored and will be allowed to exit.

The average mathematical result of this will be that, if it is structured properly, the cloak will absorb light at all points and from all directions regardless of angle or polarity, importantly, will alter the polarity of the incoming light so it is uniform, redirect it into the low-ceiling environment, and through natural curvature, gradually alter its direction and phase in such a way that, provided that the shape of the structures are maintained, light will always bend around the object, cloaking it. It should be noted, however, that such a tarpaulin would have to be kept absolutely clean and free from warping such as that caused by heating. Only with slow-moving airframes like dirigibles would there not be substantial heating of the skin of the airframe which would undoubtedly destroy any cloaking effect it might have. Ships may, however, benefit from such a system, since they are more or less stable in terms of their hull temperature. Land-based vehicles such as tanks could benefit, provided they are not caked with mud.

As for manufacture, low-temperature plasmas are ideal for this type of process as they allow for the catalyzation of polymers without damaging them. It should be well-within our capabilities to build such a structure, given that it basically requires that a polymer be cold plasma-catalyzed to change its optical properties to highly reflective, creating both the floor and ceiling of the "crawlspace." Plasma induction using a series of optical wires in the desired hexagonal configuration makes the process more like the use of a mold to mass-produce an item in classical manufacturing.

The invisibility tarpaulin would consist of an outer layer that allows light in, regardless of property, a reflective back side to that outer layer that allows light out only if its polarity is of the desired value, and beneath this, a mirror about 700nm below the back of the outer layer (also polished by the plasma.)

Gaps between the hexagonal shapes in the outer layer would be configured only to permit light of a certain polarity to exit. This can be achieved by making it so that the space between the outer hexagonal structures forms crevices that are wider on the outside and narrow as one approaches the entry into the "crawlspace." The gradually tapered crevice helps change the polarity of incoming light so that it is accepted. With no such taper on the inside, only light that has naturally returned to the correct polarity would exit the crawlspace. The ultimate driver of this would be the fact that the crawlspace is bent by exactly 180 degrees around the round or oblong object to be hidden. As long as the bounces are configured to slowly alter the polarity of light from a fixed value to its opposite value (180 degrees out of alignment is, in effect, in alignment in terms of polarity) then light will always return to the proper polarity after 180 degrees of travel around the object.

Conclusion

Thus, an invisibility cloak may be constructed affordably using materials and methods available at the present time.